MUCKLESHOOT INDIAN TRIBE

FISHERIES DEPARTMENT

17 May 2000

Mr. Jack Kennedy, Project Manager
US Army Corps of Engineers
Regulatory Branch
PO Box 3755
Seattle, WA 98124

RE: AMENDMENTS TO THE BIOLOGICAL ASSESSMENT PREPARED FOR A HABITAT DEVELOPMENT PROJECT ON THE DUWAMISH RIVER

Ref: A. Response from the US Fish and Wildlife Service
B. MITFD letter dated 24 November 1999
C. MITFD letter dated 12 April 1999.

Dear Mr. Kennedy:

The US Fish and Wildlife Service (Ref A) has provided comments upon a Biological Assessment (Ref B) submitted by the Muckleshoot Indian Tribe Fisheries Department (MTIFD) in support of a request for a permit (Ref C) to construct a habitat restoration project in the Duwamish River. The USFWS (Ref A) stated that it might be possible to reach a NLAA for bull trout based upon additional information regarding how trees that will be removed are currently functioning in providing habitat components for bull trout. Additionally, the USFWS requested additional information to support the statement of NLAA for those sections of the BA which currently state that effects would be adverse.

This letter provides the additional information requested by the USFS. Detailed responses to those questions are found in the attached document. However, a summary is presented here. The bulk of the existing vegetation is found in a fringing band along the waterward perimeter of the site. The existing vegetation on the site provides some limited overhanging vegetation that could provide cover to juvenile bull trout and other juvenile salmonids during high tide. Additionally, this fringing band of vegetation provides a source of detrital input to the estuary as well as insects that may enter the juvenile salmon and trout food chain. However, one of the existing vegetation on site provides structural complexity in terms of creating pools, inwater habitat complexity, etc.

The conclusions in the original BA regarding adverse, construction, related impacts to salmon and bull trout were very conservative. The original conclusions did not arise from anticipated, adverse changes to the structural components of habitat. Instead, the "may effect, likely to adversely effect" calls arose from perceived avoidance of the site through behavioral

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responses to (1) avoid construction related noise and inwater activity and (2) construction related increases in turbidity. However, a re-analysis of the potential impacts suggests that a call of "not likely to effect" is more warranted. Inwater work will occur during the standard in-water construction windows established by the WDFW. These windows are set to minimize the overlap of inwater construction activities with salmon and trout. By following these construction windows, the potential overlap between fish and construction, and resulting behavioral responses are thought to be minimized. Additionally, though construction will increase turbidity in the project vicinity, construction will occur during the construction window when the use of the Turning Basin by chinook salmon and bull trout is expected to be low. For these reasons, it is probable that a NLAA is warranted

Of additional note is that since the original BA was prepared, the U.S. Fish and Wildlife Service has determined that Peregrine Falcon is no longer an endangered or threatened species pursuant to the Endangered Species Act[1]. Additionally, after further review of the proposed restoration design, it is considered that though the site could benefit Bald Eagles, the measurable direct benefit would be so small that the statement on page 22 of the original BA "[I]mprovements at the site would create habitat that is presently lacking for bald eagle. This could result in a beneficial effect to this species." should be reworded to "[I]mprovements at the site *could* create habitat that is presently lacking for bald eagle. This *may* result in a beneficial effect to this species." Therefore, a call of No Effect is appropriate.

If you have any questions concerning this letter, please feel free to call me at (253) 939-3319, extension 119.

Sincerely,

Roderick Malcom
Senior Habitat Biologist.

att: 2

[1] Federal Register: August 25, 1999 (Volume 64, Number 164).

Detailed Response to USFWS Questions

The MITFD responses to the Services' comments on the BA for the Turning Basin No. 3 Restoration Site follow. The Service's comment are listed first, with the response following. All references refer to documents included in the original, submitted BA. Unless otherwise noted, all references to figures are to those included with this letter. References to figures in the original, submitted BA are noted as such.

Pg. 2 #1. piles should be removed in their entirety, not just cut off.

All piles will be removed in their entirety if permits are granted to remove them in their entirety.

Pg. 2, #2. More information is needed regarding the removal of non-native and native landscape vegetation. What is being removed. How much?

One of the objectives of the project is to increase the extent of emergent estuarine vegetation. This emergent vegetation cannot be created without removing the existing, fringing, vegetation around the waterward perimeter of the site. Due the cessation of upland operations at the site, the area occupied by Himalayan blackberry and other invasive species is increasing and the site is considerably more vegetated than when the BA was prepared. The following description reflects the condition of the site in early May 2000.

None of the existing vegetation on site provides structural complexity in terms of creating pools, inwater habitat complexity, etc. The upland area contains non-native vegetation (Deodar cedar, mountain ash, Himalayan blackberry, Scotch broom, common tansy, and grasses) and landscaped native vegetation shore pine, big-leaf maple, western red cedar, and fir. The majority of this vegetation is concentrated in a fringe around the waterward perimeter of the site. Himalayan blackberry is the dominant vegetation on site. It exists in a band extending from a mean distance 6 feet inland from the top of bank waterward to just above the line of the OHWM. It is estimated the total area covered by Himalayan Blackberry does not exceed 2,000 square feet. The majority of the other species of plants, unless otherwise noted are interspersed in this band of blackberries.

Currently, the Himalayan blackberry and other plants in the fringing band provide some benefits to juvenile salmon and bull trout. During high tides, the most waterward portion of this vegetation overhangs the water and provides a source of cover for juvenile salmonids. At high tide, insects using the vegetation may fall into the water and be consumed by juvenile salmonids. However, as the tide recedes this function diminishes and the main role of this vegetation becomes input of detrital material into the estuary. During the late afternoon, when combined with high tides, this vegetation provides some shade to the water. However, though limited shade is provided, there is no influence on water temperature. Water temperature at the site is a function of the inflows of water from Elliott Bay and the Duwamish River (Warner and Fritz 1995). Bank stability at the site is provided by armoring, not by the root masses of the fringing vegetation.

Most trees on the site appear to have been planted as ornamentals, based upon observed species composition and location. None of the trees on the site, if they entered the water are of sufficient size to be considered wood as defined in the Matrix of Pathways and Indicators (NMFS 1999). However, if they did enter the water, they would serve as a source of detrital material, attachment points for plants, and provide some, inwater cover and complexity for juvenile salmon and trout. No trees on the site provide overwater cover to adult or juvenile salmon or trout.

Within 2 to 8 feet of the top of bank, and predominately located with the blackberry band are seven trees (Table 1; Fig 1). These trees range in height from 12 to 15 feet and a diameter at breast height of 1.5 to 6 inches and provide a source of detrital material to the water. As these trees do not overhang the water, the contribution of insects to the juvenile salmon food chain is probably low. During the late afternoon, when combined with high tides, these trees provide some shade to the water. However, though some shade is provided, there is no influence on water temperature. Water temperature at the site is a function of the inflows of water from Elliott Bay and the Duwamish River (Warner and Fritz 1995). These trees do not contribute to bank stability.

Located next to the existing building on waterward side is a cottonwood. The largest, existing trees on the site are found on the landward side of the building (Fig. 2 to BA). During the late afternoon, when combined with high tides, these trees could provide some very limited shade to the water. However, though some limited shade may be provided, there is no influence on water temperature. Water temperature at the site is a function of the inflows of water from Elliott Bay and the Duwamish River (Warner and Fritz 1995).

Table 1. Summary of trees found on the site. The number listed in the serial column corresponds to the number on attached Figure 1.

Species	Serial	Height (ft)	dbh (in.)	Distance from top of bank (ft)	Potential to be retained
Cottonwood	1	12	1.5	4	No
Willow	2	15	2	4	No
Deodar cedar	3	15	4	2	No
Deodar cedar	4	15	4	2	No
Shore Pine	5	12	2	2	No
Shore Pine	6	12	2	2	No
Shore Pine	7	15	3	2	No
Cottonwood	8	20	4	40	No
Western Red Cedar	9	25	6	75	Yes, but will greatly reduce extent of emergent vegetation
Fir	10	25	4	80	Yes
Big-leaf Maple	11	25		80	Yes
Western Red Cedar	12	12	2	80	Yes

The tree, labeled as Serial 9, is located in a part of the site, slated to be graded to an elevation of 12 to 14 feet MLLW, approximately 6 to 8 feet below the existing grade. Though, it is possible to retain this tree, it would result in a decrease of emergent vegetation such as Lyngby's sedge, Three-Square bulrush, and other marsh vegetation due to the need to protect the root structure of this tree and the resultant changes in elevation of the surrounding land. Trees labeled as serials 10 through 12, are in the area currently proposed to be planted with riparian vegetation. It is possible to work around these trees and incorporate these established trees into the planting scheme.

The proposed planting scheme for trees as described in Figures 13 and 14 to the BA is summarized in Table 2. Approximately 25 trees will be planted in a riparian area of approximately 3,587 ft^2 between +17 to +21 ft MLLW. The proposed groundcover zone of 1,850 ft^2 to be constructed from +14 to +17 ft MLLW (BA Fig 8) is most similar in location and structure to the fringing vegetation band of approximately 2,000 square feet which will be removed. However, when the proposed groundcover zone is combined with the emergent bench of 6,050 ft^2 between from +9.5 to +11.0 ft MLLW and the transition area of 1,967 ft^2 between 11.0 to +14.0 MLLW; the project will result in a net increase of vegetation providing overwater coverage, detrital input, and insects.

Table 2. Tree Planting Scheme.

Species	Quantity
Red alder	7
Black Cottonwood	8
Sitka Spruce	4
Shore Pine	6

Pg. 2, #4. What work needs to be done inwater. What can be done in the dry?

The inwater work consists of removing 132 creosote treated, wood piles. All other work will be done in the dry. Proposed construction will involve excavating approximately 1,794 yd^3 of material below the plane of the OMWM, as extended inland from the current bank. As much as the upland material will be removed as possible before commencing bank excavation work to reduce the time disturbed surfaces are exposed to tidal action. It is not possible to quantify the quantity of fill material that will be removed before commencing bank excavation. When work commences on the bank, it will only be performed during that portion of the tidal cycle where material can be excavated in the dry. However, as the tide rises, the water will submerge the newly disturbed areas. All excavated fill material will be disposed at an authorized off-site disposal, storage, or recycling site selected by the construction contractor

Pg. 33, #6. How will rip rap/concrete rubble be removed. Where will it be disposed?

Smaller riprap ,rubble, and debris will be gathered by hand and placed in a crane bucket for removal. Larger rip rap, rubble, and debris will be picked and removed by a crane clamshell bucket. All materials will be disposed at an authorized off-site disposal, storage, or recycling site selected by the construction contractor.

Pg 3, #11. If piling is replaced, need to state type of piling to be used (non-creosote).

It is proposed that two of the existing pier pilings would be left for tribal fishermen to use a net attachment points during fishing season. If a permit condition is to remove all piles, then replacements of concrete or steel would be used. Whether the two existing pier pilings are left, or concrete or steel replacements are used instead, will depend upon the conditions set by the Services

Pg. 20. What measures are being used to reduce turbidity during construction?

Measures to reduce turbidity include the following:

a) a silt fence will be maintained at the perimeter of the construction;
b) except for pile removal, no underwater excavation will occur;
c) a layer of sand will be laid down at the base of each of pile to reduce suspension of fine material during pile removal;
d) when newly excavated areas between elevations 0 and +9 reach final design grades, typically underwater, they will be covered with washed sand and gravel The washed sand and gravel will reduce resuspension of fine material from the new excavated bank;
e) temporary erosion and sediment controls BMPs will be used in the upland parts of the site;
f) as much as the upland material will be removed as possible prior to commencing bank excavation work to reduce the time disturbed surfaces are exposed to tidal action.

Pg. 21 Document states that there is the potential for low-level contaminants during pile removal. How many piles will be removed. What types of contaminants might be expected.

Piles

The number of piles to be removed is 132, plus all of the approximately 3,900 square feet of overwater coverage of treated wood supported by these piles. A term of the condition of sale of the land to the Muckleshoot Tribe was that the previous landowner had the option to take possession of the pier piles and other pier components. Thus, the terms of the sale preclude the Tribe from mandating that the previous owners may not use the piles in another project. However, if the previous owners elect not to take possession of the piles, then the piles will be transported by the construction contractor to an authorized disposal, storage, or recycling site. The MITFD, itself, will not reuse the piles for a construction project.

Potential Site Contamination

Uplands

A Phase II Site Assessment, conducted by the US Corps of Engineers in 1997, determined that a release of diesel and heavy oil had occurred at two small locations on the upland portion of the site (Corps, 1997a). These areas on the upland portion of the site were fully remediated by the previous property own as a condition of sale to the Muckleshoot Indian Tribe. This upland soil was removed and subsequent testing indicated that the remaining soils in the two, remediation areas are below acceptable concentrations as listed in the MTCA (Radix Ortega Group, 1998). However, despite removal of soils from the two upland spill areas, soils from the site contain polycyclic aromatic hydrocarbons(PAH) slightly above the Model Toxics Control Act (MTCA) Method B cleanup levels (Corps 1997a). Excavation of the upland material, will remove these soils from the site. All excavated fill material will be disposed at an authorized off-site disposal, storage, or recycling site selected by the construction contractor.

Sediments

The low level contaminants expected are organics and metals. None of the samples exceeded DOE Minimum Cleanup Levels (Corps 1997a). See attached Table 2 form the Phase II Site Assessment (Corps 1997a) for a detailed description of expected contaminants. Following a Level II Site Assessment in 1997 (Corps 1997a), the Corps concluded that sediments adjacent to the property, and the pier, did not contain contaminants above Washington State Sediment Management Standards[2] Minimum Cleanup Levels, though samples exceeded Sediment Quality Standards (Corps 1997a) for arsenic, acenaphthylene, and Bis(2-ethylexly) Phthalate. Arsenic was observed at 82 mg/kg and acenaphthylene at 25,766.9 mg/kg (TOC normalized), Bis(2-ethylexly) Phthalate at 71,428.6 mg/kg (TOC normalized) compared to SQS levels of 57 mg/kg, 16,000 mg/kg, 78,000 mg/kg, respectively. Additionally, during sediment sampling, hydrocarbon sheens were visible in some samples, however, in each case, the sheen was not on the surface of the sample, but at a depth of about 5 cm, reflecting the historical nature of the contamination (Corps 1997a). Several of the sampling stations (see Table 2) contained biochemical concentrations in excess of levels shown to have minor adverse effects on biological resources.

The Corps (1997a) concluded that the property contained low levels of contamination consistent with urban waterways in the Puget Sound Basin, however, the contamination is not high enough to eliminate the property from consideration of as a restoration site. The recommendation from the Phase II Site Assessment was to remediate the upland portions of the site where petroleum spills had occurred. This has occurred.

Pg 23. The same actions to reduce impacts to chinook should be required from bull trout.

The measures listed on page 23 of the BA to reduce impacts to chinook will apply to all species of salmon and trout, including bull trout.

Trees to be removed should be used as part of the project.

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[2] Washington State Sediment Management Standards (SMS) describe two regulatory levels for selected contaminants. Sediment Quality Standards (SQS) are designed to provide a regulatory and management goal for the quality of surface sediments are used mainly to inventory sediment quality. Chemical concentrations below SQS are believed to have no adverse impacts on biological resources. The Sediment Management Standards also include Minimum Cleanup Levels (MCUL) which define chemical criteria which have demonstrated minor adverse impacts on aquatic organisms (Corps 1997a)

Native landscaped trees removed to allow bank and upland excavation will be used in the project as part of the wood emplaced into the water. The non-native trees will also be used as part of the wood placed into the water if that is the direction of the Services. Otherwise, the removed, non-native trees will be removed from the site and transported to an authorized disposal or recycling site selected by the construction contractor.

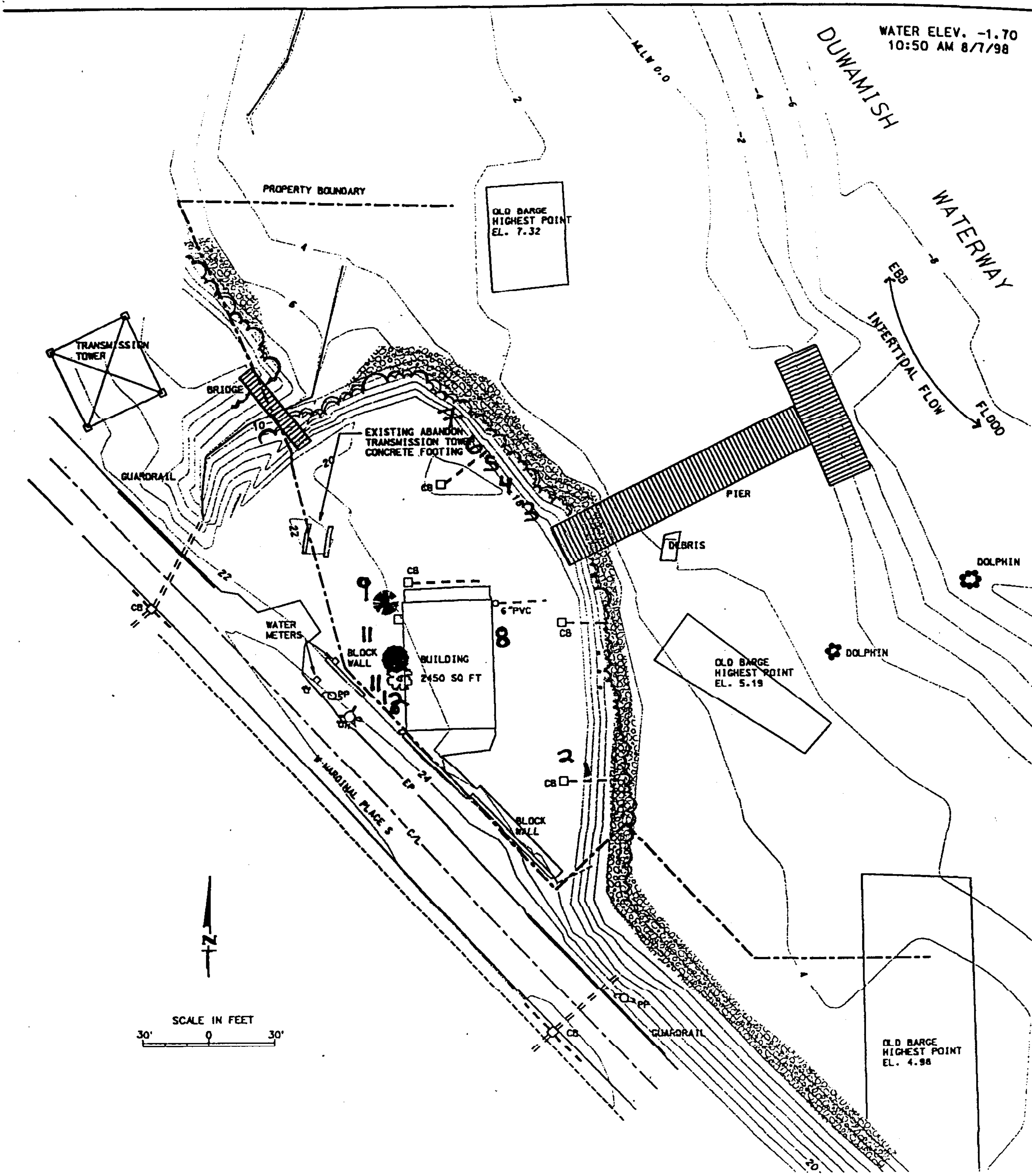

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FIGURE 1 [redacted]

Table 2. Analytical results for sediment samples collected at the Kenco Marine site, 12 June 1997. Regulatory and reference criteria are listed in the same units as the data.																				
	Sample Location																			
	K1		K2		K3		K4		K5		K6		K7		K8		SQS*	MCUL**	Freshwater Criteria	Eco Thres
Analyte	Dry Wt.	TOC Normalized	Dry Wt.	TOC Normalized	Dry Wt.	TOC Normalized	Dry Wt.	TOC Normalized	Dry Wt.	TOC Normalized	Dry Wt.	TOC Normalized	Dry Wt.	TOC Normalized	Dry Wt.	TOC Normalized				
Conventionals:																				
Total Solids (%)	53.5		56.3		61.9		57.5		66.0		60.4		53.1		60.9					
Total Volatile Solids (%)	5.7				3.4		5.7		4.0		4.7		6.0		5.3					
TOC (%)	2.41%		2.27%		1.67%		1.81%		1.54%		1.63%		2.23%		1.86%					
Metals (mg/kg dry wt):																				
Arsenic	8.0		6.0		[redacted]		7.0		5.0		6.0		6.0		[redacted]		57	93	17.0 (1)	
Barium	65.0		52.0		33.0		64.0		62.0		72.0		83.0		66.0					
Cadmium	ND		ND		ND		ND		ND		ND		ND		ND		5.1	6.7	3.53 (1)	
Chromium	22.0		22.0		23.0		19.0		17.0		19.0		21.0		20.0		260	270	90.0 (1)	
Lead	34.0		17.0		[redacted]		9.0		12.0		11.0		9.0		9.0		450	530	91.3 (1)	
Mercury	ND		ND		ND		ND		ND		ND		ND		ND		0.41	0.59	0.486 (1)	
Selenium	ND		ND		ND		ND		ND		ND		ND		ND					
Silver	ND		ND		ND		ND		ND		ND		ND		ND		6.1	6.1	0.5 (2)	
Pesticides/PCB (8080A) (ppb, dry wt.):																				
Heptachlor	ND	ND	ND	ND	2.0	119.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			0.3 (3)	
Aldrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			2 (2)	
4,4-DDE	2.5	103.7	ND	ND	2.0	119.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			6.75 (1)	
Endosulfan II	ND	ND	ND	ND	2.8	167.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND				
Dieldrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			66.7 (1)	
4,4-DDD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			8.51 (1)	
4,4-DDT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			71 (3)	
Methoxychlor	ND	ND	ND	ND	7.0	419.2	ND	ND	ND	ND	10.0	613.5	ND	ND	ND	ND				
Chlordane	ND	ND	ND	ND	187.0	11,197.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			8.9 (1)	
Aroclor 1242	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND				
Aroclor 1254	56.0	2,323.7	11.0	484.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	12,000.0	65,000.0	60 (3)	
Araclor 1260	ND	ND	ND	ND	29.0	1,736.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	12,000.0	65,000.0	5 (3)	
Total PCB	56.0	2,323.7	11.0	484.6	29.0	1,736.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	12,000.0		277 (1)	
Tributyltin (ppb, dry wt)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.4	85.9	1.1	49.3	ND	ND				
Semivolatile Organics (ppb, dry wt.):																				
Phenol	ND	-	ND	-	ND	-	ND	-	72.0	-	ND	.	ND	-	ND	-	420.0	1,200.0		
4-Methylphenol	365 B	-	ND	-	218 B	-	ND	-	ND	-	ND	.	248 B	-	ND	-	670.0	670.0		
Naphthalene	ND	ND	ND	ND	6.0	359.3	ND	ND	14.0	909.1	68.0	4,171.8	ND	ND	100.0	5,376.3	99,000.0	170,000.0		
2-Methylnaphthalene	ND	ND	ND	ND	11.0	658.7	5.0	276.2	[redacted]	2,662.3	[redacted]	15,521.5	5.0	224.2	[redacted]	2,957.0	38,000.0	64,000.0	20 (4)	
Acenaphthylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			10 (4)	
Dimethyl Phthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	53,000.0	53,000.0		
Acenaphthene	ND	ND	ND	ND	ND	ND	ND	ND	[redacted]	7,207.8	[redacted]	25766.9 D	ND	ND	[redacted]	4,838.7	16,000.0	57,000.0	10 (4)	
Dibenzofuran	ND	ND	ND	ND	5.0	299.4	6.0	331.5	84.0	5,454.5	235.0	14,417.2	5.0	224.2	62.0	3,333.3		58,000.0		
Fluorene	ND	ND	ND	ND	ND	ND	ND	ND	154.0	10,000.0	[redacted]	17,484.7	ND	ND	81.0	4,354.8	23,000.0	79,000.0	190 (2)	
Diethyl Phthalate	56.0	2,323.7	22.0	969.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	8.0	430.1	61,000.0	110,000.0		
Phenanthrene	ND	ND	ND	ND	ND	ND	75.0	4,143.6	[redacted]	46103.9 D	[redacted]	59509.2 D	69.0	3,094.2	[redacted]	16,451.6	100,000.0	480,000.0	515 (1)	

Table 2. Analytical results for sediment samples collected at the Kenco Marine site, 12 June 1997. Regulatory and reference criteria are listed in the same units as the data.

Analyte	K1 Dry Wt.	K1 TOC Normalized	K2 Dry Wt.	K2 TOC Normalized	K3 Dry Wt.	K3 TOC Normalized	K4 Dry Wt.	K4 TOC Normalized	K5 Dry Wt.	K5 TOC Normalized	K6 Dry Wt.	K6 TOC Normalized	K7 Dry Wt.	K7 TOC Normalized	K8 Dry Wt.	K8 TOC Normalized	SQS*	MCUL**	Freshwater Criteria	Ecoto Thresh
Anthracene	ND	ND	ND	ND	ND	ND	11.0	607.7	58.0	3,766.2	94.0	5,766.9	8.0	358.7	27.0	1,451.6	220,000.0	1.2E+06	220 (2)	
Carbazole	ND	ND	ND	ND	ND	ND	ND	ND	15.0	974.0	27.0	1,656.4	ND	ND	13.0	698.9				
Di-n-butyl Phthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	12 B	538.1 B	ND	ND	220,000.0	1.7E+06		110
Fluoranthene	ND	ND	230 D	10132.2 D	230 D	13772.5 D	161.0	8,895.0	580 D	37622.3 D	[illegible]	48,466.3	146.0	6,547.1	321.0	17,258.1	160,000.0	1.2E+06	2355 (1)	6
Pyrene	ND	ND	200 D	8810.6 D	210 D	12574.9 D	120.0	6,629.8	360 D	23376.6 D	520.0	31,901.8	111.0	4,977.6	211.0	11,344.1	1.0E+06	4.1E+06	875 (1)	6
Butyl Benzyl Phthalate	ND	ND	ND	ND	ND	ND	18 B	994.5 B	14.0	909.1	ND	ND	23.0	1,031.4	ND	ND	4,900.0	64,000.0		110
Benzo(a)anthracene	ND	ND	ND	ND	ND	ND	41.0	2,265.2	104.0	6,753.2	186.0	11,411.0	39.0	1,748.9	61.0	3,279.6	110,000.0	270,000.0	385 (1)	
Chrysene	ND	ND	ND	ND	ND	ND	56.0	3,093.9	126.0	8,181.8	153.0	9,386.5	56.0	2,511.2	67.0	3,602.2	110,000.0	460,000.0	862 (1)	
Bis(2-ethylexyl) Phthalate	ND	ND	ND	ND	ND	ND	200 JB	11049.4 JB	1100 JD	71428.6 JD	ND	ND	200 B	8968.6 B	ND	ND	47,000.0	78,000.0		
Di-n-octyl Phthalate	ND	ND	ND	ND	ND	ND	17.0	939.2	19.0	1,233.8	17.0	1,042.9	22.0	986.5	20.0	1,075.3				
Benzo(b)fluoranthene	ND	ND	ND	ND	ND	ND	69.0	3,812.2	94.0	6,103.9	133.0	8,159.5	72.0	3,228.7	73.0	3,924.7	230,000.0	450,000.0		
Benzo(k)fluoranthene	ND	ND	ND	ND	ND	ND	42.0	2,320.4	58.0	3,766.2	80.0	4,908.0	43.0	1,928.3	41.0	2,204.3	230,000.0	450,000.0	240 (2)	
Benzo(a)pyrene	ND	ND	ND	ND	ND	ND	36.0	1,989.0	50.0	3,246.8	73.0	4,478.5	34.0	1,524.7	43.0	2,311.8	99,000.0	210,000.0	782 (1)	4
Indeno(1,2,3-cd)pyrene	ND	ND	ND	ND	ND	ND	52.0	2,872.9	59.0	3,831.2	74.0	4,539.9	56.0	2,511.2	64.0	3,440.9	34,000.0	88,000.0	200 (2)	
Dibenz(a,h)anthracene	ND	ND	ND	ND	ND	ND	7.0	386.7	9.0	584.4	11.0	674.8	7.0	313.9	9.0	483.9	12,000.0	33,000.0	170 (2)	
Benzo(g,h,i)perylene	ND	ND	ND	ND	ND	ND	25.0	1,381.2	29.0	1,883.1	37.0	2,269.9	28.0	1,255.6	34.0	1,828.0	31,000.0	78,000.0	60 (2)	
Total PAH	ND	ND	430.0	15,925.9	6.0	359.3	712.0	39,337.0	2,516.0	163,376.6	3799.0	233,067.5	669.0	30,000.0	1,467.0	78,871.0			4000 (2)	40
Total LPAH	ND	ND	430.0	15,925.9	6.0	359.3	86.0	4,751.4	1,047.0	67,987.0	1928.0	118,282.2	77.0	3,452.9	604.0	32,473.1	370,000.0	780,000.0		
Total HPAH	ND	ND	ND	ND	ND	ND	626.0	34,585.6	1,469.0	95,389.6	1,871.0	114,785.3	592.0	26,547.1	863.0	46,397.8	960,000.0	5.3E+06		

Shaded values exceed an ecotox threshold; bordered values exceed a regulatory criteria.

* WA Marine Sediment Quality Standards

** WA Marine Sediment Cleanup Screening Levels

1. Interim Sediment Quality assessment Values (Draft) Probable Effects Level, Environment Canada, 1994. Adverse biological effects are frequently observed above this level.
2. Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario, Lowest Effect Level, Persaud et al., 1993. Indicates the level of sediment contamination tolerated by most benthic organisms.
3. Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario, No Effect Level, Persaud et al., 1993. Indicates the level of sediment contamination which has no impact to fish or benthic organisms.
4. Interim Criteria for the Evaluation of Sediments of the St. Lawrence River, No Effects Level, Environment Canada, 1991. Contaminant concentrations below which no chronic or acute effects have been observed in living organisms.
5. U.S. EPA, Effects Range Low, Long et al, 1995. Contaminant concentrations below this level are rarely associated with adverse effects.
6. U.S. EPA, Sediment Quality Criteria, 1993. Adverse biological effects have been observed above this level.
7. U.S. EPA, Sediment Quality Benchmarks, 1995. Adverse biological effects have been observed above this level.
8. Puget Sound Dredge Disposal Analysis Program, Screening Level, Michelson and Shaw, 1996. Concentrations below the Screening Level rarely cause acute effects in bioassays.

Data Qualifiers:

B - Analyte present in the blank and the sample.

D - Analytes analyzed at a secondary dilution.

J - Estimated Value

Biological Assessment

for the Turning Basin #3 Aquatic Habitat Restoration Project

Proposed agency actions:	Approval of a habitat restoration plan submitted by the Elliott Bay/Duwamish Restoration Program (EBDRP) in the Turning Basin #3 located at River Mile 5.2 on the Duwamish River, King County, Washington Township 23 Range 04E Section 4.
Type of statement:	Biological Assessment
Lead agency:	Muckleshoot Indian Tribe Fisheries Department
Cooperating agencies:	Federal: Department of the Interior, US Fish and Wildlife Service, State of Washington: Department of Ecology Department of Fish and Wildlife; Department of Natural Resources; Tribal: Muckleshoot Indian Tribe; Suquamish Indian Tribe *Local:* City of Seattle; King County/Metro
For further information:	Roderick Malcom *Muckleshoot Indian Tribe Fisheries Department* 39015 172nd Avenue Southeast Auburn, Washington 98093 Phone (253) 931-0652 Facsimile (253) 931-0752

Abstract: This Biological Assessment (BA) evaluates the impacts of the preferred restoration alternative to construct the Elliot Bay/Duwamish Restoration Panel (EB/DRP) Turning Basin Number 3 restoration project upon chinook salmon and coho salmon, bull trout, coastal cutthroat trout, Bald Eagle, Peregrine Falcon and Oregon spotted frog. The EB/DRP proposes restoring estuarine intertidal and riparian and terrestrial habitat to a portion of the Turning Basin #3 on the Duwamish River. The project, located in the Duwamish River at River Mile 5.2, involves removing existing upland and inwater structures, and excavating existing 1,794 yd^3 of fill material to create three intertidal and supra-tidal habitat benches on a 0.82 acre site. Approximately 6,500 ft^2 of salmon and trout habitat; 7,404 ft^2 of bird and wildlife habitat and 6,060 ft^2 of habitat used by salmon, trout, birds, and wildlife would be restored for a total of 19,954 ft^2 of fish and wildlife habitat. Intertidal and riparian native vegetation would be planted to increase habitat and food for fish and wildlife. Project construction is considered to "may affect, likely to adverse affect" chinook and coho salmon and bull and coastal cutthroat trout. However, the project itself will have beneficial impacts upon chinook and coho salmon and bull trout and coastal cutthroat trout through improved long term water quality, increase riparian corridor, restored estuarine wetlands, and increased feeding sources and opportunities. Project construction and the project are considered to have "no effect" on Bald Eagle, Peregrine Falcon, and Oregon spotted frog

Biological Assessment for
Turning Basin #3 Aquatic Habitat Restoration Project

Contents

Biological Assessment for
Turning Basin #3 Aquatic Habitat Restoration Project

1.0 .... Introduction

1.1 Introduction

This Biological Assessment (BA) was prepared to determine the impacts of implementing the preferred Alternative for the Turning Basin #3 Aquatic Habitat Restoration Project in the Duwamish River, King County, Washington upon Threatened and Endangered Species and Critical Habitat under the Endangered Species Act (ESA) of 1973 as amended and Essential Fish Habitat under the Magnuson-Stevens Fishery Conservation and Management Act. This BA covers species under the jurisdiction of either the National Marine Fisheries Service (NMFS) or the US Fish and Wildlife Service.

The project proposes to remove an existing commercial wharf, associated upland structures, excavate fill material, create three habitat benches, and plant native inter-tidal and riparian vegetation to restore fish and wildlife habitat at River Mile 5.2 of the Duwamish Estuary (Township 23 Range 04 East Section 4). This project is part of the implementation of a Consent Decree as detailed below.

This restoration project is proposed under the Elliot Bay/Duwamish Restoration Program (EBDRP). The EBDRP is cooperative, inter-governmental program established under a Consent Decree entered on 23 December 1991. The Consent Decree settled a complaint filed on 19 March 1990 by the United States for the National Oceanic and Atmospheric Administration (NOAA) acting of behalf of the public as a trustee for natural resources. The complaint was filed under Section 107 of CERCLA, 42 U.S.C. § *9607 9 (a) to assess and recover damages for* alleged injuries to United States' trust resources in Elliott Bay and the Duwamish River. The other natural resources trustees parties to the consent decree were: The US Fish and Wildlife Service (USFWS), the State of Washington Department of Ecology (Ecology), the Suquamish Indian Tribe and the Muckleshoot Indian Tribe. The defendants named in the lawsuit were the Municipality of Metropolitan Seattle (Metro

[1]) and the City of Seattle (City).

The settlement under the Consent Decree stipulates that Metro and the City will provide a combination of cash payments, real estate, and in-kind services to be used to clean up contaminated sediments, make habitat improvements, and prevent recontamination of sediment remediation and habitat projects in Elliott Bay and the lower Duwamish River. A Panel of Managers is implementing the Consent Decree. The Panel of Managers of the Elliott Bay/Duwamish Restoration Program (EBDRP) include: U.S. Department of Commerce National Oceanic and Atmospheric Administration; the U.S. Department of the Interior Fish and Wildlife Service; Washington State Department of Ecology, Muckleshoot Indian Tribe, Suquamish Indian Tribe, City of Seattle; and King County. In 1992, the Panel established several Technical Working Groups, including the Habitat Development Technical Working Group (HDTWG) chaired by the USFWS. The Technical work groups consist of representatives from the entities comprising the Panel of Managers, Washington State Department of Fish and Wildlife (WDFW); Washington State Department of Natural Resources (DNR); the US Army Corps of Engineer (COE), the Port of Seattle, and others.

The Turning Basin #3 Aquatic Habitat Restoration Project will restore previously lost aquatic and

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[1] On 1 January 1994, the Muncipality of Metropolitian Seattle became the King County Department of Metropolitian Services (Metro)

riparian habitat and ecological functions to aid in recovery of fish and wildlife. This project will aid in providing connectivity among past, present and future projects along the Duwamish River.

1.2 Project Description

The purpose of this project is to restore estuarine emergent marsh and riparian areas to benefit fish and wildlife resources in the Green/Duwamish River by removing fill material placed into the estuary, upland buildings, and a commercial wharf. The project is located at RM 5.2 of the Duwamish River (Fig.1) on property owned by the Muckleshoot Indian Tribe. Currently, the site is an abandoned, commercial marine operation (Figure 2) with upland buildings and a wharf. A detailed description of the site is found in Section 2.2.1. Project construction would start in May 2000 and end by 31 December 2000. The upland buildings, much of the wharf as possible without involving inwater work and much of the fill material would be removed to create intertidal benches and habitat zones (Fig. 8) prior to June 15. Between June 15 and 1 July, the existing wharf would be removed and the site exposed to the Duwamish River. Riparian and intertidal plantings would occur during appropriate tidal stage and time of the year.

The following activities will occur at the site

removal of the pier by either by barge or upland equipment based on the wharf apron. The preferred method would be to remove the structure by basing the equipment on the wharf and working landward. The exact method will be determined by permit conditions and equipment availability. If a barge is to be used, the barge will only work at times of the day when it will not ground on the existing mudflat. The piles will either be pulled or cut off at the mudline. The exact method will be determined by the permit conditions, though the preference is to pull the entire pile.

1) removal of all non-native and all native, landscape vegetation.

removal of existing upland structures and features (e.g. buildings, concrete foundation, and wooden bridge).

One upland concrete pad, which is partially outside of the property boundary, will remain. excavation of the upland fill material to the desired grade. Proposed construction will involve excavating approximately 1,794 yd^3 of material below the Mean Higher High Water [2] (MHHW) and depositing to an off-site location (Figure 11). This volume of material includes a material located within the upland site that is located below the plane of the OHWM if extended towards Marginal Place. Much of the work will be done in the dry though inwater work will be required. The exact sequence and timing of work will be determined by permit conditions. Erosion control measures will include use of silt fences, as applicable, and other standard Best Management Practices (BMPs). Erosion control measures will be taken during excavation by installing a silt fence at the construction area perimeter. As excavation progresses toward final finish grades, the silt fence will be repositioned to the next targeted excavation perimeter.

removal of existing utilities and storm drains;

removal of concrete rubble and riprap from the bank;

after the current slope is regraded into habitat benches (Figure 8) and slopes, the lower bench would be buttressed with large woody (Figure 9) and connected with galvanized chain to small earth anchors (Figure 10) to prevent bank sloughing during root development. After the intertidal vegetation is established, the wood would be left to decay naturally. The Elliott Bay/Duwamish Habitat Development Technical Work Group elected to use large wood rather than rip rap to maintain the slope during root development to minimize unnatural elements in the project and river and to mimic nearby areas in the River where sedge benches are stabilized by naturally occurring large wood. Some rootwads would be

[2] Mean Higher High Water is a tidal datum. It is defined as the average of the higher high water height of each tidal day observed over the National Tidal Datum Epoch.

emplaced to roughen the edge of the woody debris to create eddies and reduce flow laminarization so as reduce erosion at and off the site. The large woody debris would be left to decay naturally as it is expected that the intertidal vegetation would have become established in the interim and the bank would be stable. As it is not the intent of the Technical Work Group to maintain bank, stabilizing features at the site over the long term, ecology blocks or other large weights will not be used. Loss of wood from the project will not be considered a failure unless the rate of loss is such that the growing root masses are unable to stabilize the bank. Root wads observed to interfere with the exercise of Treaty Fishing access, would be relocated or removed after consolation with the NMFS and the US Fish and Wildlife Service;

habitat benches and zones, and transition areas, would be planted (see following description)with native vegetation (Figure 13);

fences approximately 3 feet high and maximum two-inch mesh, would be erected for 3 to 4 years to protect growing plants from forging geese until intertidal vegetation becomes established (Caren Crandall, University of Washington, Center for Urban Horticulture, personal communication, dated 8-14-98). Facilities to exclude geese from vegetation plantings are becoming more common and designs are changing. Between the preparation of this document and permit issuance, other designs might be deemed to provide more benefit. Though, the exact design may differ, the potential footprint and impacts to natural resources would be equivalent or less.

the upland boundary of the site would be marked by a 6-ft high chain link fence to protect the site and prevent dumping of refuse;

two pier pilings would be left, or replacement set in existing locations, for tribal fishermen to attach set nets during fishing season;

The hired contractor would be responsible for maintaining and replacing dead or dying vegetation until the entire site has been vegetated to the standards set by the EBDRP;

A stewardship plan to maintain the site; and

A monitoring plan being developed by the Elliott Bay/Duwamish Habitat Technical Development Work Group.

The following specifies the proposed habitat bench and zone areas with elevation ranges (see also Figure 8):

1) lower bench (6,500 ft^2) constructed from +2.0 to + 9.5 ft MLLW;
2) emergent bench (6,050 ft^2) constructed from +9.5 to +11.0 ft MLLW;
3) transition area (1,967 ft^2) from +11.0 to +14.0 MLLW;
4) groundcover zone (1,850 ft^2) constructed from +14 to +17 ft MLLW; and
5) riparian zone (3,587 ft^2) from +17 to +21 ft MLLW.

Given these tidal elevations approximately 6,500 ft^2 of salmon and trout habitat; 7,404 ft^2 of bird and wildlife habitat and 6,060 ft^2 of habitat used by salmon, trout, birds, and wildlife depending upon tidal stage would be restored for a total of 19,954 ft^2 of fish and wildlife habitat

The emergent bench would be planted with Lyngby's sedge (*Carex lyngbyei*), hardstem bulrush (*Scirpus acutus*), three-square bulrush (*Scirpus americanus*), and seaside arrowgrass (*Triglochin maritima*). The area of transition between the emergent and shrub benches would be seeded with Douglas aster (*Aster subspicatus*), tufted hairgrass (*Deschampsia caespitosa*), saltgrass (*Distichlis spicata*), meadow barley (*Hordeum brachyantherum*) and Pacific silverweed (*Potentilla anserina*). The groundcover or shrub bench would be planted with Red-osier dogwood (*Cornus sericea*), sweet gale (*Myica gale*), Pacific ninebark (*Physocarpus capitatus*) and Hooker's willow (*Salix hookeriana*). The riparian zone would be planted with red alder (*Alnus rubra*), Indian plum (*Oemleria cerasiform*), black cottonwood (*Populus balsa*), Sitka spruce (*Picea sitchensis*) shore pine (*Pinus contorta contorta*) and snowberry (*Symphoricarpos albus*).

2.0 Project Area

2.1 Green/Duwamish Basin

The project site is located in Township 23 Range 04 East Section 4 along the Duwamish River (Fig 1). The Duwamish River is this location is also referred to as the Duwamish Estuary and the Duwamish Waterway. The lower ten-mile segment of the Green/Duwamish River (WRIA 09.0001) system from the City of Tukwila to Elliot Bay by Seattle is known as the Duwamish River. The rest of the river, upstream from the its confluence of the Black River, approximately the upper extent of tidal influence, is known as the Green River (Williams et. al 1975). Historically, the Duwamish/Green River drained a 1,642 square miles watershed (US Army Corps of Engineers [Corps] 1997). The three main sub-basins, the Black, Green, and White Rivers were separated for navigation and flood control in the early 20th century (Blomberg et al. 1988). The White River was diverted by a high water event in 1906 and retained in the new channel. The bulk of the Black River was drained permanently in 1916 with the construction of the Ballard Locks in Lake Washington and the lowering of Lake Washington, with flow now restricted to a small tributary, Springbrook Creek. Currently the Duwamish drains only the Green River basin of 483 square miles.

Furthermore, the remnants of this system, the present Green/Duwamish basin have been greatly modified from its pre-development ability to create and maintain salmon habitat. The City of Tacoma built a water diversion dam at RM 61 in 1913. The US Army Corps of Engineers Howard Hanson Dam was constructed at RM 64.0 in 1961. Neither dam was built with fish passage facilities, eliminating access to an estimated 107 miles of historic anadromous fish habitat (Corps1998a) as well as dramatically altering the quantity and quality of downstream salmon habitat. The lower floodplain, below RM 37.3, historically consisted of rapidly shifting meanders, but now this area is almost completely contained within levees or revetments, resulting in the lack of riparian cover, large woody debris, off-channel rearing areas, and reduced channel storage capacity (Corps1997; Fuerstenberg et al., 1996). Flood control operations at the HHD have encouraged further urban and commercial development in the floodplain (Corps, 1997, 1998a; Fuerstenberg et al., 1996), which have reduced the extent of the riparian corridor, filled side channels and degraded water quality and quantity. The lower 10 miles of the river, the reach in which the project is located has been almost completely altered from its pre-development condition (Blomberg et al. 1988). The Duwamish estuary once contained nearly 5,300 acres of intertidal mudflats, marshes and riparian[3] habitats (Blomberg et al. 1988). Today, only 2% of these areas exist in the Duwamish River (Blomberg et al. 1988). . Since settlement, there has been a 98% loss of shallows, intertidal mudflats and tidal marshes in Green/Duwamish estuary and a 100 percent loss of tidal swamps (Blomberg et al. 1988). As a result, Blomberg et al. (1988) estimated that there are only 45 acres of intertidal mudflat and tidal marsh left in the Duwamish Estuary. Of the 22.6 miles of total shoreline length between the mouth and River Mile 6.5, (an area 1.3 mile distance upstream from the project site), 44% is riprapped, 34% covered by pier aprons and 7% covered by sheet piling, leaving approximately 15% in lessor forms of disturbance (derived from data in Tanner 1991). Furthermore, a considerable portion of the remaining intertidal and shallow subtidal portions of the Green/Duwamish estuary is covered by barges (Muckleshoot Indian Tribe Fisheries Department [MITFD], unpub data).

The result of these alterations is that 1) both the extent and quality of habitat has declined greatly and 2) the natural processes that contribute to the formation and maintenance of salmon habitat in the Green/Duwamish River severely diminished. The diminishment of these natural processes have significantly reduced the ability for the river and estuary processes to form salmon habitat in the Green/Duwamish in both the freshwater and estuarine reaches of the river (Corps 1997).

[3] Riparian is the area of transition between the terrestrial and aquatic communities.

Given the dramatic reduction in sediment inputs and channel confinement (Corps 1997), it is unlikely that natural processes will create additional habitat in the Duwamish estuary.

2.2 Turning Basin Number 3 Project Area.

2.2.1 General

Past dredging and filling within the lower ten miles of Duwamish River created a constructed waterway four and a half miles long with three "turning basins" (Sato, 1997). The project site is located on the left bank (looking downstream) within the last upstream vessel turning basin or Turning Basin #3 at River Mile 5.2 of the Duwamish River. Prior to modern development, Turning Basin #3 was a tidal swamp and river channel (Blomberg et al. 1988; Tanner, 1991).

The project site is located at 10054 West Marginal Place South, , Seattle, Washington and is adjacent to the Duwamish River (Figure 1). The 0.82-acre property (32,000 ft^2 of upland and 4,100 ft^2 of intertidal mudflat) was purchased by the Muckleshoot Indian Tribe in 1997 for the purpose of restoring fish and wildlife habitat as part of the EBDRP. There is an office/warehouse structure, small storage sheds, and asphalt and concrete pads located on the site (Figure 2). A T-shaped, commercial pier made of creosote treated wood extends approximately 125 feet into Turning Basin #3. The King County Sensitive Areas Map Folio (1990) does not indicate the presence of wetlands at the project site. The entirety of the upland site is fill material of various depths. There is a small wetland fringe (approximately 50 ft^2) along the south property boundary that extends onto the adjacent property. The steep slope in this location confines the wetland plants to a narrow band in the intertidal zone. The emergent area includes native vegetation. The upland area at this site contains non-native vegetation (Deodar cedar, mountain ash, himalayan blackberry, Scotch broom, common tansy, and grasses) and landscaped native vegetation (shore pine). The largest of the four existing conifers trees is approximately four inches dbh and 25 feet high. The US Department of Agriculture (USDA) National Resource Conservation Service (1952) classifies land in this area as urban. Urban land is defined as land that has been modified by disturbance. The natural soil layer has additions of fill material several feet thick in order to accommodate large industrial and housing developments. In the Green River valley of which the Duwamish River is part, the fill ranges from 3 ft to 12+ ft thick and has a texture from gravelly sandy loam to gravelly loam. A Phase II Site Assessment, conducted by the US Corps of Engineers in 1997, determined that a release of diesel and heavy oil had occurred at two small locations on the upland portion of the site (Corps, 1997a). These areas on the upland portion of the site were fully remediated by the previous property own as a condition of sale to the Muckleshoot Indian Tribe. This upland soil was removed and subsequent testing indicated that the remaining soils in the two, remediation areas are below acceptable concentrations as listed in the MTCA (Radix Ortega Group, 1998). However, despite removal of soils from the two spill areas, soils from the site contain polycyclic aromatic hydrocarbons(PAH) slightly above the Model Toxics Control Act (MTCA) Method B cleanup levels (Corps 1997a).

Kenco Marine Services formerly owned this site, and used it as a commercial marine operation, including moorage and vessel repair. Under the previous ownership of Kenco Marine, the site was used primarily as a staging and support area for one boat in the northern fishing fleet and moorage for barges and tug boats (Corps, 1994). Minor repair work, such as battery replacement, oil lubrication, and minor painting of tugs and barges also occurred at the site (Corps, 1994). The barges and ships previously moored at the site were moved to other locations by September 1998. As a result, all tug and barge staging, support and maintenance operations that previously occurred at the site have ceased.

Owners (Figure 1) of property adjacent to the site include: Seattle City Light to the North at 9600 West Marginal Way South and the Washington State Department of Transportation (WSDOT) to the South . The Port of Seattle and the Washington Department of Natural Resources own various portions of the bed of the river.

To the south and east the site is bounded by the Duwamish River. At low tides, extensive mudflats are present. Two barge hulks are located approximately 25 feet beyond the property boundary of the site. Across the Duwamish River are commercial buildings associated with the Boeing Corporation. To the north is power station operated by Seattle City Light. Towers are present at this site, one within 100 feet of the northern boundary of the restoration site. Powerlines pass over the site the northwest part of the site. To the west is West Marginal Was, then State Route 99. Just beyond SR-99 is a low, vegetated bluff above which residential development occurs. King County Parks has an easement for a bike and pedestrian trail through adjacent properties along Marginal Place to the north and the south of the project site. King County does not have an easement through the project site. King County will construct the bike trail within the existing road right-of-way between the project site and Marginal Place (pers. comm. between Roderick Malcom, Muckleshoot Tribe and Mile Lozano King County Parks).

2.3 Environmental Baseline

The Environmental Baseline at and influencing the site as well as species use at the site was evaluated against the NMFS Matrixes of Pathways and Indicators (Table 2a) contained in "A Guide to Biological Assessments" (NMFS 1999) and contained (Table 2b) in "Essential Fish Habitat" for Pacific Salmon (Pacific Fishery Management Council 1999; NMFS 1998a) and "Essential Fish Habitat for Ground Fish (NMFS 1998b). This discussion 1) elaborates, if required, upon the habitat information presented above; 2) explains, if necessary, the reasons for the various rankings; and 3) explains why specific indicators are not relevant to the project site.

Though the Duwamish Waterway and River meets State water quality parameters for temperature. However, temperatures are a problem. Surface water temperature in the Duwamish River are dependent upon the temperature in the Green River system. Surface flow temperatures ranged from 7.58°C in late March to 19.5°C in early August at nine sampling sites located from Duwamish River mile 1.6 to 10.4(Warner and Fritz, 1995). In the Turning Basin, approximately 200 feet from the proposed restoration site, waster temperatures have varied from 2.5 to 17.8°C (MITFD, unpub data). At the project site, water temperature is primary influenced by the relative temperatures of the freshwater inflow and the salt water intruded from Elliott Bay (Warner and Fritz 1995). This salt water intrusion profoundly influences water temperature at various depths in the Turning Basin (MITFD, unpub data). In January. water temperatures measured at 1 m depths can increase from 2.5°C to 8.2°C over a depth of 8 m. In May, temperature measured at 1 m depths can decrease from 17.7° to 11.6°C measured over a total depth of 4 m. In September, temperatures are more uniform decreasing from 16.6° to 13.8°C. The range of temperatures over depth is also influenced by the tidal stage. The variation in water temperature with depth provides adult and juvenile salmonids some refuge from the higher temperatures. However, in the late summer and early fall, the general range of temperatures offers no refuge from temperatures considered outside the preferred range.

The River meets Ecology water quality standards for turbidity according to the 1996 Section 303(d) list. Turbidity is mainly a function of river flow. Warner and Fritz (1995) found the highest turbidity levels were recorded at low tide. Turbidity levels at 3.25 feet below the surface of the water averaged 18.8 NTU in the estuary as a whole (Warner and Fritz, 1995). Turbidity as measured in the Turning Basin over a period of several months can range from 2.0 t0 122 NTUs (mean of 29 with a standard deviation of 23.8) and varies with depth and tidal stage (MITFD, unpub data). The exposed gravel parking is a source of fine sediment and hence turbidity to the Duwamish River.

The sediment indicator is not relevant to this site. The site is located in an estuary and salmon spawning does not and will not occur at the project site.

The 1996 Section 303(d) List for the State of Washington lists the Duwamish Waterway and River has exceeding numerous State water quality parameters. The River has high levels of contamination from industrial and other sources and is listed on the 303(d) list for a variety of pollutants, dissolved oxygen and pH.

Water quality in the Duwamish River has been severely degraded by years of industrial discharge, municipal sewage, stormwater runoff and nonpoint source agricultural waste. Metals that have been documented in the Duwamish River estuary include: arsenic; cadmium; chromium; copper; iron; mercury; nickel; lead and zinc (NOAA Restoration Center, 1998). The Duwamish Waterway and River exceeds State water quality parameters for bioassay, numerous metals and organics. The US Army Corps of Engineers (1994) analyzed sediment samples from the Kenco Marine site for a Phase I Assessment. Samples exceeded the state Department of Ecology's (DOE) Sediment Management Standards (SMS) for arsenic and acenaphthylene. None of the samples exceeded DOE Minimum Cleanup Levels (Corps 1997a). Maintenance dredging of the Duwamish Waterway occurs approximately every other year. The portion of the Duwamish Waterway adjacent to the project site, but outside the work boundaries of the proposed project, is ranked "low-moderate" for sediment contaminant levels (Corps 1997a). A Phase II Site Assessment was conducted in 1997 to address concerns arising from the Phase I Analysis conducted in 1994. The 1997 assessment concluded that sediments adjacent to the property, and the pier, did not contain contaminants above Washington State Sediment Management Standards Minimum Cleanup Levels, though two samples exceeded Sediment Quality Standard (Corps 1997a).

During sediment sampling, hydrocarbon sheens were visible in some samples, however, in each case, the sheen was not on the surface of the sample, but at a depth of about 5 cm, reflecting the historical nature of the contamination (Corps 1997a).

The Duwamish Waterway and River fails to meet State water quality parameters for dissolved oxygen. Dissolved oxygen levels were normally above 7 ppm at nine sampling sites located from Duwamish River mile 1.6 to 10.4 with dissolved oxygen levels near saturation in the spring and lower in the late summer (Warner and Fritz, 1995). However, dissolved oxygen levels decreased with increased water depth (Warner and Fritz, 1995), with decreasing freshwater inflow and increasing water temperature. In the Turning Basin, dissolved oxygen decreased with increasing depth from 11.1 to 7.1, while in September, DO decreased from 6.3 to 5.3 as depth increased. Late summer and early fall dissolved oxygen concentrations are likely to impair chinook holding, migration and rearing.

The 1996 Section 303(d) List for the State of Washington lists the Duwamish Waterway and River has failing to State water quality parameters for pH. Duwamish River pH values are subject *to change following changes in salinity. The pH levels at nine sampling sites along the Duwamish* River ranged from 6.9 and 8.9 (Warner and Fritz, 1995). However, in the Turning Basin, pH ranged from 7.1 to 8.9 as a function of depth, tidal stage and date.

Though passage barriers exist on numerous tributary streams and on the mainstem Green River at RM 61, no mainstem passage barriers exist downstream of the site or on the site.

The intertidal and subtidal portions of Turning Basin No. 3 consists of mudflat. This is a natural condition for the site (Blomberg et al. 1988). As mudflat is the natural condition of the project vicinity the substrate indicator does not apply.

No large woody debris is found at the site. The site is located at the current head of navigation and is dredged by the US Army Corps of Engineers, whom use the area as a sediment trap. This dredging operation also removes wood that poses a threat to navigation. Though, the NMFS has not set standards for the volume or quantity of large woody debris in estuaries, estuaries are naturally expected to have large quantities of wood. Due to the lack of naturally occurring wood at the site and the lack of a riparian corridor to contribute wood to the river, the site was ranked as "Not Properly Functioning".

Pool frequency was considered not applicable at this site. The project area is in a tidally, influenced, low energy environment with considerable deposition. Pools are not expected to occur frequently in this environment. However, the dredging operations of the Corps can create a large, deep pool. Additionally, the rise and fall of the tides plus the high turbidity at the site provide a very, large concealed area for adult salmon to hold in. For this reason, pool quality is considered to be "Properly Functioning".

The southwestern part of the Turning Basin functions as a backwater. However, past land use practices, river channelization and construction of levees and revetments have eliminated off channel habitats, the majority of other estuarine backwater areas, habitat refugia, and floodplain connectivity.

The width to depth ratio is considered none applicable to this site. The ratio was developed in response to observed changes in freshwater streams due to alterations in flow, bank vegetation, in-channel complexity, etc. Depth is not constant at the project site is it is tidally influenced.

Most of the stream bank in the Duwamish River is stable. However, this stability is achieved by the presence of levees and bulkheads. Due to the pervasive extent of this bank hardening, a "Not Properly Functioning" rating was used.

The River at the project location has experienced pronounced change in peak flow and base Howard Hanson Dam at RM 63 operates as a flood control facility, reducing peak flows to less than 12,000 cfs, a level insufficient to maintain natural processes (Corps 1997). The City of Tacoma Water Diversion Dam at RM 61 reduces low flows to below naturally occurring levels. Urban development in the surrounding cities of Tukwila and City has created a large, but unquantified increase the drainage network. It is considered that this increase exceeds 25%.

Major, valley bottom roads occur in former wetlands, intertidal mudflats, and riparian areas. Though unquantified, it is considered that there are more than 3 miles of road per square mile.

There is no Late Successional Old-Growth in the project area nor the Duwamish Estuary Corps 1997. Urban development is intensive throughout the area. The riparian reserve system is effectively non-existent in the Green River below River 26 (Corps 1997). The riparian areas near the project site and both upstream and downstream consist generally of exotic species, landscaping, or planted native vegetation. The riparian reserve provides inadequate protection of habitats and refugia.

Table 2a. The following table is derived from the NMFS "A Guide to Biological Assessments" dated 23 March 1999. "NA" means not applicable

PATHWAYS:	ENVIRONMENTNAL BASELINE		
INDICATORS	Properly Functioning	At Risk	Not Properly Functioning
Water Quality			
Temperature			X
Sediment/Turbidity	NA/X		
Chemical contamination/nutrients			X
Habitat Access	X		
Physical Barriers			
Habitat Elements			
Substrate	NA	NA	NA
Large Woody Debris			X
Pool Frequency	NA	NA	NA
Pool Quality	X		
Off-channel habitat			X
Refugia			X
Channel condition and dynamics			
Width/depth ratio	NA	NA	NA
Streambank condition			X
Floodplain connectivity			X
Flow/Hydrology			
Peak/Base flows			X
Drainage network increase			X
Watershed Conditions			
Road density and location			X
Disturbance History			X
Riparian Reserves			X

The Duwamish estuary once contained nearly 5,300 acres of intertidal mudflats, marshes and riparian

[4] habitats (Blomberg et al. 1988). Today, only 2% of these areas exist in the Duwamish River

[4] Riparian is the area of transition between the terrestrial and aquatic communities.

(Blomberg et al. 1988). Since settlement, there has been a 98% loss of shallows, intertidal mudflats and tidal marshes in Green/Duwamish estuary and a 100 percent loss of tidal swamps (Blomberg et al. 1988). Due to this the estuary is considered "Not Properly Functioning" for habitat quantity and aerial extent. Due to sediment contamination problems described above, and loss of upstream contributing sources of habitat inputs such as water, sediment, and wood, and shoreline alterations due to bank stabilization as well as the frequent occurrence of piers and wharves, habitat quality at the project site and in the Duwamish Estuary is considered "Not Properly Functioning". Exotic plant and animal species are present in the basin, though there impact upon threatened species at or off the project site is unknown. However, exotic plant species have adversely influenced estuarine and riparian areas. The other indicators in listed in Table 2b have been previously discussed and that discussion will not be repeated.

Table 2b. The following indicators are taken from Appendix A to the Description of *Identification of Essential Fish Habitat, Adverse Impacts and Recommended* Conservation Measures. Amendment 14 to the Pacific Coast Salmon Plan, dated 28 August 1998.

INDICATORS	Properly Functioning	At Risk	Not Properly Functioning
Estuarine Conditions			
Habitat quantity/quality			X
Aerial extent			X
Hydrologic conditions/sediment/nutrient input			X
Estuarine Water Quality			
Dissolved oxygen, temperature nutrients, chemical contamination			X
Sediments			X
Exotic species		X	

3.0 .... List of Threatened and Endangered Species

The NMFS was contacted for list of Threatened and Endangered Species as well as candidate species known or suspected to be at the project site or in the vicinity. A response was received (see Appendix A). A summary of known or suspected Threatened, Endangered or Candidate species is presented in Table 3.

Table 3. Summary of known or suspected Threatened, Endangered or Candidate species.

Common Name	Scientific Name	Status	At site	In vicinity
Fish				
Puget Sound Chinook Salmon	*Oncorhynchus tshawytscha*	Threatened	Yes	Yes
Puget Sound/Strait of Georgia Coho salmon	*O. kisutch*	Candidate	Yes	Yes
Birds				
Bald Eagle	*Haliaeetus leucocephalus*	Threatened	Yes	Yes
Peregrine falcon	*Falco peregrinus*	Threatened	Unknown	Yes
Bull Trout	*Salvelinus confluentus*	Threatened	Yes	Yes
Coastal Cutthroat Trout	*Oncorhynchus clarki clarki*	Candidate	Yes	Yes
Amphibians				
Oregon spotted frog	*Rana pretiosa*	Candidate	Unknown, but unlikely	Unknown, but unlikely

4.0 .... Description of the Species and Habitat.

4.1 Fisheries Resources in the Basin

The Duwamish River is a significant migratory route, rearing area and holding area for anadromous salmonids in the Green/Duwamish River basin (NOAA Restoration Center, 1998, Warner and Fritz, 1995; Salo and Grette, 1986). The Green Duwamish basin is used by many species of salmonids. Chinook (*Oncorhynchus tshawytsha*) and coho salmon (*O. kisutch*) are found in the basin and are known to rear and hold at the project site. The Duwamish River also supports runs of chum salmon (*O. keta*), and summer and winter runs of steelhead trout (*O. mykiss*) Williams, 1975; WWFW and Western Washington Treaty Tribes, 1994). Juvenile chum salmon have been found in larger numbers at the project site (Warner and Frtiz 1995) and are particularly dependent upon an estuary for growth prior to moving to marine areas. Chum salmon spawn in the Green River above RM 30. Juvenile steelhead due to their large size at outmigration have a short estuarine residence time. Upstream adult steelhead migration can occur year round. Sockeye salmon (*O. nerka*) also occur in the river though it is unknown if the population is self-sustaining or consists of strays from the Lake Washington system. The timing of adult sockeye migration is unknown, but spawning adults are seen in the Green River above RM 35 in September and October. Adult pink salmon have been observed spawning in low numbers in the Green River (pers. Comm between Roderick Malcom, MITFD and Steve Foley, WDFW). However, it is unknown if the observed spawners are strays, a relict population, and a new population in the process of being established. Pink spawning has been successful in the Green River as *juvenile* pink salmon (*O. gorbuscha*) have been found in the Duwamish River estuary (Warner and Fritz, 1995).Sea run coastal cutthroat trout (*O. clarki*) and Dolly Varden char (*Salvelenius malma*) are also present in the Duwamish River (NOAA Restoration Center, 1998). A detailed list of salmon stocks and trout is presented in Table 4, as well as the status of the stock.

Estuaries are designated as Essential Fish Habitat for numerous species of ground fish (NMFS 1998b). The extent to which adult or juvenile ground fish use the site is unknown.

The mouth of Hamm Creek is located approximately 0.5 mile downstream (south) of the Turning Basin #3. This creek contains resident populations of cutthroat trout, sculpin (*Cottus*, spp.) and western brook lamprey (*Lampetra richardsoni*), (Divens, 1997) and is used by spawning and rearing coho.

Table 4: Salmon species and stocks found in the Green/Duwamish River. Species and stocks are derived from WDFW and WWTT (1994) unless otherwise noted. The NMFS Evolutionary Significant Units (ESU) and listed or proposed Endangered Species Act (ESA).

STOCK [1]	STOCK ORIGIN [2]	PRODUCTION TYPE [3]	ESU	ESA Status
Duwamish/Green River Fall Chinook	Mixed [4]	Composite [7]	Puget Sound [10]	Threatened
Newaukum Creek Fall Chinook	Mixed	Wild [8]	Puget Sound [10]	Threatened
Duwamish/Green River Fall Chum	Mixed	Composite	Puget Sound /Strait of Georgia [11]	Not Warranted
Crisp (Keta) Creek Fall Chum	Non-native [5]	Cultured [9]	Puget Sound /Strait of Georgia [11]	Not Warranted
Green River/Soos Creek Coho	Mixed	Composite	Puget Sound/Strait of Georgia [12]	Candidate
Newaukum Creek Coho	Mixed	Composite	Puget Sound/Strait of Georgia [12]	Candidate
Duwamish/Green River Summer Steelhead	Non-native	Composite	Puget Sound [13]	Not Warranted
Duwamish/Green River Winter Steelhead	Native [6]	Wild	Puget Sound [13]	Not Warranted
Duwamish/Green River Early Winter Steelhead	Non-native	Cultured	Puget Sound [13]	Not Warranted
Following species or stocks are not listed in the 1994 document				
Green River Sockeye	Unknown	Wild	Not Determined	Uncertain
Green River Bull Trout [14]	Native	Wild	Puget Sound	Threatened
Green River Coastal Cutthroat Trout [15]	Native	Wild	Puget Sound	

Notes:

1. As defined in WDFW and WWTT (1994), the fish spawning in a particular lake or stream(s) at a particular season, which fish to a substantial degree do not interbreed with any group spawning in a different place, or in the same place at a different season.
2 The genetic history of the stock
3. The method of spawning and rearing that produced the fish that constitutes the stock.
4. A stock whose individuals originated from commingled native and non-native parents, and/or by mating between native and non-native fish (hybridization) or a previously native stock that has undergone substantial genetic alteration.
5. A stock that has become established outside of its original range
6 An indigenous stock of fish that have not been substantially impacted by genetic interactions with non-native stocks, or by other factors, and is still present in all or part of its original range.
7. A stock sustained by both wild and artificial production
8. A stock that is sustained by natural spawning and rearing in the natural habitat, regardless of parentage (includes native)
9. A stock that depends on spawning, incubation, hatching, or rearing in a hatchery or other artificial production facility.
10. Meyers et al. (1998).
11. Johnson et al. (1997).
12. *Weitkkamp et al. (1995).*
13. Busby et al. (1996).
14. Listed in WDFW SASSI (1998)
15. Johnson et al (1999)

4.2 Chinook Salmon

4.2.1 General Habitat Requirements

Adult chinook can return to their natal rivers to spawn from early spring to late fall, though summer and fall returns dominate. Chinook spawning mainstem rivers and larger tributaries in areas with acceptable depth and water velocity above areas of suitably sized gravel. Spawning does not occur in estuaries. Stream flow, gravel quality and turbidity influence the survival of developing chinook eggs. Two races of chinook have evolved: 1) stream type and 2) ocean type. Stream type chinook have a longer juvenile freshwater juvenile residency and tend to spawn higher in streams than ocean type chinook (Meyers et al. 1998).

Chinook salmon fry are typically 33-36 mm in length when they emerge from the spawning gravel and move to rearing areas. Juvenile residence in freshwater and subsequent size and timing of migration to the estuary are highly variable. Ocean-type chinook, can migrate seaward immediately after yolk absorption, but most migrate 30-90 days after emergence and typically reside in estuaries for one to three months before entering coastal waters of higher salinity (Healey 1980, 1982; Congleton et al. 1981). Regardless of time of entrance into the estuary, juvenile ocean-type chinook salmon spend from 1 to 3 months in these habitats(Meyers et al. 1998)). In an estuary, chinook salmon fry (< 40 mm) prefer protected habitats with lower salinity, moving from the edges of marshes during high tide to protected tidal channels and creeks during low tide (Healey 1980, 1982). As the fish grow, they move into more saline waters and increasingly less-protected habitats. In contrast, chinook fingerlings (55-70 mm), with their larger size, immediately take up residence in deeper-water estuarine habitats upon estuary entry.

Juvenile chinook salmon diet during estuarine residence is highly variable and is dependent upon the particular estuary, year, season, and prey abundance. In general, chinook are opportunistic feeders with feeding and growth functions of fish size and the habitat occupied. Insects dominate the diet of fry (<40mm) whether the fish is rearing in a stream or the tidal channel of an estuarine marsh (Meyer et al. 1981; Levings et al. 1995). Fingerling diet (55-70mm) is very dependent upon the habitat occupied. Fingerlings in freshwater feed on insects, while those in more saline areas feed on epibenthic crustaceans (Meyer et al. 1981; Levings et al. 1995), while taking insects opportunistically (Meyer et al. 1981; Levings et al. 1995). In altered estuaries, the diet can be dominated by pelagic species such as calanoid copepods (Weitkamp and Schadt 1982). At 70 mm, juvenile chinook are physiologically capable of osmoregulating in full strength seawater (Clarke and Shelbourn 1985) and are large enough to feed on larger prey including larval and juvenile fish (Healey 1991). Ocean-type juvenile chinook that have been using estuarine or marine shoreline habitats will have typically migrated offshore at about this length.

4.2.2 Duwamish/Green Chinook.

Overview

Chinook salmon in the Green/Duwamish River are considered part of the Puget Sound Evolutionary Significant Unit (ESU) (Meyer *et al.* 1998). Green/Duwamish chinook are considered to be ocean type chinook. The Washington State Salmon and Steelhead Stock Inventory Report (SASSI) (WDFW and Western Washington Treaty Indian Tribes 1994) lists two summer/fall chinook stocks in the Green/Duwamish system: 1) Duwamish/Green summer/fall chinook and 2) Newaukum Creek summer/fall chinook. These two populations are listed as separate stocks pending genetic analysis, however it is possible that they are of the same population (WDFW and WWTT 1994). Both stocks are considered part of the Puget Sound chinook Evolutionary Significant Unit (Meyer et al. 1998). Chinook salmon are found through the entire accessible portion of the Green/Duwamish River as well as the major tributaries, such as Soos and Newaukum Creeks (WDFW and WWTT 1994).

The Green/Duwamish summer/fall chinook is a composite stock with minimal influence from stocks outside of the Green River, while the Newaukum Creek stock is considered native (WDFW and WWTT 1994). Duwamish/Green chinook production is composite with hatchery production at Soos Creek, which enters the Green River at RM 34, and natural spawning throughout the river from RM 26 to the TPU Diversion Dam at RM 61, as well as the major tributaries. Hatchery chinook are considered part of the ESU, but the hatchery itself is not considered essential for recovery. Chinook production in Newaukum Creek is based upon natural production and considered wild (WDFW and WWTT 1994).

Genetic Stock Identification sampling has indicated that the chinook taken at the hatchery and chinook from the natural spawning grounds in the Green River are genetically identical. Escapement levels into the Green River between 1990 and 1998 ranged from 2479 to 10584 with a mean of 6893 chinook. Between 1990 and 1998, the escapement goal of 5,800 chinook was meet in all but two years, 1993 and 1994. The Newaukum stock though, initially classified as healthy (WDFW and WWTT 1994) based on escapement estimates ranging from 300 to 3,000 from 1987 through 1991 with an average of 1,600 per year, the escapement from 1992 through 1996 has dropped to an average of approximately 700 chinook.

Adult Use

Adult chinook salmon commence entering the lower Duwamish River in early July and upstream migration peaks in late August to early September (NOAA Restoration Center, 1998). Turning Basin #3 is a major holding area for adult chinook waiting to ascend to the spawning grounds in the Green River. Above this reach, the River is narrower increasing river velocity and thus salmon energy expenditures during holding and below the reach there is considerable disturbance from barge and shipping traffic. Adult chinook are generally not found in the estuary after the end of the first week of October (MITF, unpub data). The lowermost extent of chinook spawning observed in recent years in the Green/Duwamish River is approximately RM 24, 19 miles upstream of the project area (MITFD and WDFW, unpub. data) . Spawning occurs in September and October with the young generally emerging by February.

Juvenile Use

Upon emergence from the gravel, juvenile chinook can either migrate downstream to the estuary to rear as fry or spend weeks to several months rearing in freshwater prior to departing for the estuary. Recent surveys of side channels in the Green River between RM 34 and 44 and found juvenile chinook use of side channels (R2 Resource Consultants, Inc. 1999) suggesting an extended freshwater rearing phase for Green River chinook. Chinook residing within upstream freshwater habitats (or hatcheries) can be in excess of 70 mm when they reach the estuary. These fish are capable of moving offshore very soon after migrating from the river and are less dependent on estuarine rearing. It is unknown if the lack of observations of fry migrants in the estuary is a result of habitat or genetic factors or an extended freshwater rearing phase. .

Juvenile chinook are present in the Duwamish estuary from mid-February through early September, with the peak in mid to late May. The observed peak of juvenile chinook in the Duwamish Estuary and at Turning Basin #3 corresponds with the release of hatchery fingerlings (Warner and Fritz, 1995). After the second week of June, the number of juvenile chinook declines rapidly to where less than 2 were collected per beach seine in July (Warner and Fritz, 1995). Juvenile chinook salmon densities were higher at Turning Basin #3 (River mile 6.2) than at nine other sampling stations between Duwamish River mile 1.6 and 10.4 (Warner and Fritz, 1995), suggesting that Turning Basin #3 is an important rearing area for juvenile chinook salmon. Juvenile chinook were observed in the Duwamish Estuary from later February through early September, The extensive mudflats and appropriate salinity regime probably account for the large numbers of observed juvenile chinook. Warner and Fritz (1995) found the greatest juvenile chinook densities were found over the finest grain size substrate, and corresponded to surface salinities in the 5-10%~ range. However, chinook appear to be slowing their movement into the estuary near RM 7 to begin their acclimation to salt water. Thus, the critical saltwater transition zone for juvenile chinook salmon appears to be located between RM 7 and 5 (Warner and Fritz, 1995), an area that straddles the proposed restoration site at RM 5.2. Warner and Fritz (1995) noted that the bulk of the juvenile chinook reached the estuary as fingerling rather than a fry migrants.

4.2.3 Critical Habitat/Essential Fish Habitat

Critical habitat, as listed by NMFS Protected Resource Division, includes all marine, estuarine and river reaches accessible to chinook salmon in Puget Sound. This includes the Duwamish/Green River.

The Duwamish/Green River below the Diversion Dam at RM 61 is also considered Essential Fish Habitat (EFH) (Pacific Fishery Management Council, 1999) (Pacific Fishery Management Council, 1999). The important elements of chinook salmon marine EFH are 1) estuarine rearing; 2) early ocean rearing; and 3) juvenile and adult migration. Important features of this estuarine and marine habitat are 1) adequate water quality; 2) adequate temperature; 3) adequate prey species and forage base (food); 4) and adequate depth, cover, marine vegetation, and algae in estuarine and near-shore habitats (Pacific Fishery Management Council, 1999).

4.4 Coho salmon

Coho salmon (*O. kisutch*) were listed as a Candidate species under the ESA by NMFS (Status list received May21, 1999, Appendix A).

Adult coho salmon migrate upstream in late August through December (Salo and Grette, 1986, WDFW and WWTT 1994) and there is no distinct peak to the upstream migration (MITFD, unpub. data).. Spawning occurs in smaller and shallower streams than for chinook. However, all spawning occurs in freshwater. Coho salmon spawn in most of the accessible tributaries of the Green River as well as much of the mainstem river above RM 25. The major spawning tributaries are Newaukum Creek and Soos Creek. Additionally, coho salmon spawn and rear in Hamm Creek, whose mouth is located approximately 0.5 mile downstream (south) of the Turning Basin #3 (Divens, 1997). Juvenile coho salmon migrate downstream from mid-February through mid-May. The peak of downstream migration is mid to late April which corresponds with hatchery releases, though outside of hatchery releases the number of coho in the system was unpredictable (Warner and Fritz, 1995). Due to there large size at outmigration, 70 to 120 mm, coho smolts are less dependent on the estuary for acclimization to salt water and growth, therefore their residence times are shorter than chum or chinook.

4.3 Bald eagle

The Bald eagle (*Haliaeetus leucocephalus*) is listed as Endangered under the ESA. The USFWS provided a letter (March 15, 1999, Appendix A) which states wintering bald eagles might be present from October 31 to March 31 in the vicinity (T23N R4E S4) of the project. No Bald Eagle nests were reported in the vicinity of the project by the US Fish and Wildlife Service.

Bald eagles are present in Elliot Bay all year. Elliot Bay is located approximately five miles downstream of the project site. There have been documented occurrences of eagles in the Duwamish Estuary, Kellogg Island, Lincoln Park and Seward Park. Bald eagles were observed on the Duwamish River from September 1996 through February 1997 (Cordell et al. 1997), time periods outside of the normal wintering period.

No specific literature information on the occurrence of bald eagles at Turning Basin #3 has been found, though Bald eagles have been observed flying over Turning Basin #3 (pers. obsn Roderick Malcom, MITFD).

Present habitat at Turning Basin #3 is not conducive to bald eagles perching, roosting or foraging. The Turning Basin #3 project site does not contain large trees suitable for perching, though Eagles might be attracted to large electrical transmission towers at the Seattle City Light transformer station, which is adjacent to the north property boundary (Corps 1998b).

4.4 Peregrine falcon

Peregrine falcon (*Falco peregrinus*) is a listed as Endangered under the ESA. The USFWS provided a letter (March 15, 1999, Appendix A) stating that spring and fall migrant falcons might occur in the vicinity of the project. Peregrine falcons have been observed foraging along the Duwamish Waterway. Known roosts, perches and hunting area include: the Washington Mutual Tower; the Interstate 5 Freeway Bridge; Terminal 91; Terminal 86; West Seattle Freeway Bridge. Eight to ten peregrine falcons wintered in the area in 1996 (NOAA Restoration Center, 1998).

No specific information on the occurrence of peregrine falcons at Turning Basin #3 has been found.

4.5 Bull trout

The bull trout *(Salvelinus confluentus)* is listed as threatened under the ESA. The USFWS provided a letter (March 15, 1999, Appendix A) stating bull trout (*Salvelinus confluentus*) might inhabit the area in the project's vicinity. The US Fish and Wildlife Service has approved a Habitat Conservation Plan for Plum Creek Timber Company, LP. which notes that bull trout are not found in the Green River above Howard Hanson Dam (US Fish and Wildlife Service and the National Marine Fisheries Service 1995, 1996)). Watson and Toth (1994) also note that despite extensive surveys no bull trout have been found in the headwaters of the Green River. However, a bull trout was collected in the Duwamish Estuary at the project site found at the site in 1994 (Warner and Fritz 1995). The collected individual was identified as a bull trout by genetic analysis. It is unknown if this collected bull trout was of Green/Duwamish or a migrant from another system. Native char have been found in the Green River as far upstream as RM 40; however, there is insufficient evidence to determine if these fish are fluvial or anadromous bull trout or dolly varden (US Fish and Wildlife Service and the National Marine Fisheries Service 1995, 1996).

Bull trout are generally non-anadromous and live in variety of habitats. However, the Coastal/Puget sound bull trout are anadromous, migrating and maturing in Puget Sound or the Pacific Ocean. Bull trout may spend 2 to 4 years in natal streams prior to migrating to larger water bodies in transit to Puget Sound.

If bull trout do occupy the proposed project area, it is likely that the use is one of migration and feeding. Spawning will not occur in the estuary. Spawning generally occurs in September and October, with some spawning in August in stream above 4,000 feet in elevation and as late as November in coastal stream. Spawning occur in low gradient stream reaches in areas of cold water, generally from 2 to 4°C. Water temperatures in the lowland streams adjacent to the project site are unlikely to support spawning bull trout. Anadromous fish migrate to the ocean in the spring and return in late summer and the early fall.

The migration periods of juvenile bull trout are similar to that of juvenile chinook salmon. Because of the complexities involved in the life history characteristics of bull trout, and the considerable variation among subpopulations, it is difficult to isolate and estimate how and to what extent particular activities may impact bull trout.

4.6 Coastal Cutthroat Trout

Coastal cutthroat trout (*O. clarki*) are a candidate species under the Endangered Species Act. Coastal cutthroat may occur in the project area as resident cutthroat trout are found in the Green/Duwamish River and in Hamm Creek, 0.5 miles downstream. The large size of juvenile sea-run cutthroat at outmigration reduces their dependency on the estuary, though they can move repeatedly in and out of the estuary to feed. The outward migration of sea-run smolts would typically occur in April and May with upstream migration of adults in July through February. It is probable that coastal cutthroat spawn in Hamm Creek.

4.7 Oregon spotted frog

The Oregon spotted frog is a Candidate species under the ESA. The USFWS provided a letter (March 15, 1999, Appendix A) stating Oregon spotted frogs might occur in the vicinity of the project site. No specific information on the occurrence of the Oregon spotted frog near the project site was found. In general, frogs require moist, forest habitat with riparian and freshwater pools (Corps 1998b). The absence of this type of habitat at the Turning Basin #3 suggests that frogs would not be present.

5.0 Inventory and Surveys

The presence and timing of coho and chinook salmon in the project vicinity and Duwamish River is well known due to a lengthy history of harvest (MITFD, unpub. data) and research surveys (Warner and Fritz 1995) and compilations of existing information sources (WDFW and WWTT 1994; Salo and Grette 1986)) The information contained in these reports is consistent with the general knowledge of species requirements and migration timings. Little is known about bull trout use of the Duwamish River.

6.0 .... Analysis of Effects

6.1 Introduction

Though the overall effect of the proposed action is beneficial to chinook, coho, bull trout, and coastal cutthroat and their habitats, there will be construction related adverse affects to these species. Project construction is not expected to result in a take of listed species, but may cause some adverse impacts to listed and candidate salmon and trout and segments of their habitat. Adverse impacts to groundfish essential fish habitat were considered to be equivalent in nature for those presented in this discussion for the salmonid species. Project construction will have "no effect" on Bald Eagle, Peregrine Falcon, or Oregon spotted Frog

6.2 Effects on salmon and trout

A summary of project effects upon chinook and coho salmon is presented in Tables 5a and 5b. The same tables were also used to analyze project construction effects and project effects on bull trout and cutthroat trout. Construction impacts are separated from the impacts of the project once constructed. Construction effects, if they differ project effects following construction , are noted with a "C", while project effects following construction are noted with a "X". All adverse impacts are local in nature and would be non-discernable at the scale of the Duwamish Estaury. Beneficial project impacts listed in the "restore" category are presumed to be local benefits in the immediate project vicinity.

Table 5a. The following table is derived from the NMFS "A Guide to Biological Assessments" dated 23 March 1999.

PATHWAYS:	ENVIRONMENTNAL BASELINE			EFFECTS OF THE ACTIONS		
INDICATORS	Properly Functioning	At Risk	Not Properly Functioning	Restore	Maintain	Degrade
Water Quality						
Temperature			X		X C	
Sediment/Turbidity	NA/X			/X	X/	/C
Chemical contamination/nutrients			X	X		
Habitat Access Physical Barriers	X				X	See Turbidity
Habitat Elements						
Substrate	NA	NA	NA	NA	NA	NA
Large Woody Debris			X	X		

Pool Frequency	NA	NA	NA	NA	NA	NA
Pool Quality	X			X		C
Off-channel habitat			X		X	
Refugia			X	X		
Channel condition and dynamics						
Width/depth ratio	NA	NA	NA	NA	NA	NA
Streambank condition			X	X		
Floodplain connectivity			X			
Flow/Hydrology						
Peak/Base flows			X		X	
Drainage network increase			X		X	
Watershed Conditions						
Road density and location			X		X	
Disturbance History			X		X	
Riparian Reserves			X	X		C

Project construction and operation will have no influence upon water temperature. Water temperature in this part of the estuary is a function of freshwater inflow and tidal stage (Warner and Fritz 1995). The existing vegetation on the site does not influence local water temperature and hence is removal will not increase temperatures or the duration of elevated temperatures. The intertidal area in the project vicinity is a mudflat; Fine sediment concentrations are naturally high and the area is not used by spawning salmonids. However, the operation of project construction equipment and project construction will increase turbidity at the site and adjacent locations due to pile removal and bank excavation. This has the potential to create behavioral barriers to the movement of fish or impair their use of the project area. Following project construction, construction related turbidity from the site would cease. Turbidity leaving the site following construction is expected to be less than the existing condition due to the filtering effect of the planted vegetation and the removal of the fine sediment generating surfaces such as the existing gravel parking lot.

The project does not include any activities that will generate the compounds listed on the Section 303(d) list. The closure of the former marine facilities and trucking operation has reduce the inputs of many of the metals and organics into the Duwamish Waterway. The removal of the creosote treated piles and wharf at the site will remove a long-term leaching of creosote and its degradation products into the sediment and the water column (Corps1997a). The construction of the riparian buffer, though not the primary purpose, will filter some street runoff prior to it entering the water. The project is not expected to alter the dissolved oxygen fecal coliforms, or other natural water quality parameters at the site.

The project will not create any additional passage impediment or barriers, nor exacerbate existing offsite passage problems. However, construction activities at the site, such as pile and wharf removal singularly, or in combination with turbidity generated by construction activities have the potential to create behavioral barriers to the movement of fish and/or impair fish use of the immediate vicinity. Though not generally considered a passage barrier, removal of the fill at the site restore salmon and trout access to a formerly accessible, estuarine area.

Project will have no effect upon substrate as the term is used in the Matrix of Pathways and Indicators.

Project construction will not remove or move large woody debris. The project will include the placement of wood along the bank and the planting of trees which over the long term will contribute wood, shade, and detrital input into the estuary. The operation of construction equipment and turbidity is expected to have some adverse impacts upon the ability of salmon use portions of the Turning Basin for rearing and holding, and this is considered a decline in pool quality.

Project construction will not effect existing off-channel habitat, nor will the project create any off-channel habitat. No existing refugia are found on-site. The project will increase refugia by the creation of a riparian area. In concert with other restoration projects in the Turning Basin, such as the upstream Coastal America site, locally significant increases in refugia are expected.

Project construction will not degrade streambank condition, though the project itself will restore the existing hardened bank to a slope, naturally vegetated bank. The local decrease in bank hardening is considered to be in the "restore" category.

Project construction and the project will restore some of the former estuarine floodplain, emergent intertidal vegetation, and riparian areas.

Project construction and the project itself will not influence the existing level of peak/base flows, the drainage network increase and the road density and location. Construction will remove three to five trees, of approximately 25 feet. Removal of the existing vegetation would create a adverse impact over the immediate to short term, the planting of native vegetation at the site would provide better, overall habitat conditions in terms of species composition and density. The non-native vegetation growing along the banks of the property will be predominately replaced by intertidal vegetation. Within 15 years of planting the riparian area will have trees exceeding 25 feet and in greater density than the existing condition. Overall, the constructed riparian area will be more diverse, and will increase riparian function in the local area and provide a long-term source of wood recruitment, shade, and detrital input.

Table 5b. The following indicators are taken from Appendix A to the Description of Identification of Essential Fish Habitat, Adverse Impacts and Recommended Conservation Measures. Amendment 14 to the Pacific Coast Salmon Plan, dated 28 August 1998.

INDICATORS	Properly Functioning	At Risk	Not Properly Functioning	Restore	Maintain	Degrade
Estuarine Conditions						
Habitat quantity/quality			X	X		
Aerial extent			X	X		
Hydrologic conditions/sediment/nutrient input			X		X	
Estuarine Water Quality						
Dissolved oxygen, temperature, nutrients, chemical contamination			X	X		
Sediments			X	X	C	
Exotic species		X		X		

Project construction will not degrade existing estuarine habitat area and quality, while the project will restore estuarine habitat area and quality. Singularly and in concert with existing nearby estuarine restoration projects, this project will have cumulative, beneficial impacts upon on- and off-site detrital inputs. Project construction and presence will maintain the current baseline environmental conditions for hydrologic conditions, sediment, and nutrient input. Project construction will not increase the current level of environmental degradation associated with dissolved oxygen, temperature, nutrients, chemical contamination, however, an effect of the project will be to reduce long-term potential for chemical contamination as previously described. Project construction will not increase levels of contaminants in the sediments, however there is the potential for release of low-level contaminants during pile removal. The project itself will reduce long-source of contaminants to the sediment. The project will not influence the existing distribution of non-native animals or fish; however, project construction will remove existing non-native vegetation and replace it with native vegetation.

6.3 Bald eagle

The project site does not provide optimum habitat conditions for bald eagles due to nearby electrical transformer towers and commercial industries and lack of suitable perches. No nesting eagles will be disturbed by construction activities. Upon maturation, planted black cottonwood planted in the riparian zone, would provide better perching conditions for immature and adult bald eagles. The mature riparian zone would also provide a an visual and sound buffer from road traffic. Increased structure along the face of the project may trap salmon carcasses which eagles upon which eagles could feed. Improvements at the site would create habitat that is presently lacking for bald eagles. This would result in a beneficial impact to this species.

6.4 Peregrine falcon

The project site does not provide optimum habitat conditions for peregrine falcons due to nearby electrical transformer towers and commercial industries. As all known nesting areas are more than 1 mile from the project site, no adverse effects are expected upon nesting falcons.

Upon maturation, planted black cottonwood planted in the riparian zone, would provide better perching conditions for peregrine falcons. The increased area of intertidal mudflat and vegetation would provide habitat for some birds taken as prey by peregrine falcons. The mature riparian zone would also provide a visual and sound buffer from road traffic. Improvements at the site would create habitat that is presently lacking for peregrine falcons. This could result in a beneficial effect to this species.

6.5 Bull trout/coastal cutthroat

Project construction is considered to "may affect, likely to adverse affect" bull trout and coastal cutthroat trout. Potential construction related short-term adverse effects to bull trout and coastal cutthroat trout as the same as for chinook salmon. The project itself will have no adverse effects on either species. Improvements at the site would create cover and foraging estuarine habitat that is presently lacking for bull trout and coastal cutthroat trout. This would result in a beneficial impact to this species, though the beneficial impacts would not be as great for bull trout due to their reduce dependency upon shallow water estuarine areas.

6.6 Oregon spotted frog

Project construction would not effect Oregon spotted frogs or their habitats. As mentioned in Section 3.6, the Oregon spotted frog's preferred habitat is currently absent at Turning Basin #3. Improvements at the site would create a forested riparian area but not freshwater pools. If there is freshwater in the area and a source of immigrants, Oregon spotted frogs might eventually utilize the newly created habitat at Turning Basin #3. This could result in a beneficial impact to this species.

7.0 .... Management Actions Related to the Species

7.1 Chinook salmon

To accomplish the objectives of the project, excavation of soils, placement of fill and stabilization of the lower intertidal bench will be necessary. During the pier removal and bank excavation phases, there is the possibility that water quality would be effected by an unavoidable increase in turbidity from the disturbed sediments and uplands. Impaired water quality can effect both adult and juvenile fish migration and use of the site. The removal of the piles and wharf and other inwater work has the potential to disturb adult or juvenile fish rearing, feeding, or holding in the vicinity. By using the erosion control measures outlined in Section 2, doing as much work as possible in the dry, and adhering to the WDFW in-stream work windows of June 15 to 1 July and 16 October to March 14impacts to fish would be reduced. There are no spawning areas downstream of the project site that will be impaired by the turbidity. The nearest spawning area is located in Hamm Creek and is suitable for coho and trout, not chinook. Furthermore, and any *turbidity from the project site is unlikely* move upstream against the current into the spawning areas of Hamm Creek

The following additional activities will be implemented to reduce construction related adverse effects on chinook:

1) Inwater work will cease if dead, dying or distressed salmonids are observed. Appropriate regulatory agencies will be contacted and the reasons ascertained;
2) fueling and staging areas will be as located as far from the river as possible;
3) a spill response plan will be in place
4) remove piles and wharf elements will be removed at the discretion of the contractor to an authorized disposal site or storage facility for recycling purposes;
5) garbage from work crews will be removed from the site daily;
6) temporary erosion and sediment control facilities will be inspected daily.

There would be no long-term, adverse effects to chinook salmon or their habitat under this Alternative. The value of this area will be increased by habitat improvements at this site compared to the existing conditions , would benefit juvenile chinook salmon by:

1) increased the area of intertidal vegetation available for foraging,
2) increased production of invertebrates consumed by juvenile chinook;
3.) providing overhanging riparian vegetation for cover from predators and detrital input;
4.). removing creosote treated pilings from the water, a potential long-term source of PAH contamination in the juvenile chinook food chain; and
5.) *placing root wads to provide cover from predators and attachment points for food items.*

A long term monitoring plan is being developed as part of the EB/DRP to ensure the site develops the desired habitat characteristics and to ensure the corrective action is undertaken as needed.

7.2 Coho salmon

Same potential short-term adverse effects as listed for chinook salmon. However the extent of beneficial impacts will be less as juvenile coho are not as estuarine dependent than juvenile chinook.

7.3 Bull trout and coastal cutthroat trout

During the pier removal and bank excavation phases, there is the possibility that water quality would be effected by an unavoidable increase in turbidity from the disturbed sediments and uplands. Impaired water quality can effect both adult and juvenile bull trout and coastal cutthroat migration and use of the site. The removal of the piles and wharf and other inwater works has the potential to disturb adult or juvenile fish rearing, feeding, or holding in the vicinity. By using the erosion control measures outlined in Section 1.2, doing as much work as possible in the dry, and adhering to the WDFW in-stream work windows of June 15 to 1 July and 16 October to March 14impacts to fish would be reduced. There are no mainstem spawning areas downstream of the project site that will be impaired by the turbidity. The nearest potential spawning area is located in Hamm Creek. It is unlikely that any turbidity from the project site would move upstream into areas suitable for spawning in Hamm Creek.

There would be no long-term, adverse effects to bull trout and coastal cutthroat trout or their habitat under this Alternative. The value of this area will be increased by habitat improvements at this site compared to the existing conditions, and would benefit bull trout and coastal cutthroat trout by:

1) increased the area of intertidal vegetation available for foraging,
2) increased production of invertebrates consumed by juvenile trout;
3) increased production of small, estuarine fish for adult trout consumption
3) providing overhanging riparian vegetation for cover from predators and detrital input;
4) removing creosote treated pilings from the water, a potential long-term source of PAH contamination in the juvenile chinook food chain; and
5) placing root wads to provide cover from predators and attachment points for food items.

A long term monitoring plan is being developed as part of the EB/DRP to ensure the site develops the desired habitat characteristics and to ensure the corrective action is undertaken as needed.

8.0 .... Conclusion

The project's construction effects upon listed and candidate species are presented in Table 6.

Table 3. Summary of known or suspected Threatened, Endangered or Candidate species.

Common Name	Scientific Name	Status	Conclusion
Fish			
Puget Sound Chinook Salmon	*O. tshawytscha*	Threatened	May affect, likely to adversely affect
Puget Sound/Strait of Georgia Coho salmon	*O. kisutch*	Candidate	May affect, likely to adversely affect
Birds			
Bald Eagle	*H. leucocephalus*	Threatened	No effect
Peregrine falcon	*F. peregrinus*	Threatened	No effect
Bull Trout	*S. confluentus*	Threatened	May affect, likely to adversely affect
Coastal Cutthroat Trout	*O. clarki clarki*	Candidate	May affect, likely to adversely affect
Amphibians			
Oregon spotted frog	*R. pretiosa*	Candidate	No effect

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Appendix A. Correspondence

Appendix B. Figures